UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/822,476	04/12/2004	Jan Antonis	KEL01 P-134	3126

28101 7590 08/05/2008
VAN DYKE, GARDNER, LINN & BURKHART, LLP
SUITE 207
2851 CHARLEVOIX DRIVE, S.E.
GRAND RAPIDS, MI 49546

EXAMINER	
ROBERTS, JESSICA M	

ART UNIT	PAPER NUMBER
2621	

MAIL DATE	DELIVERY MODE
08/05/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/822,476	ANTONIS, JAN	
	Examiner	**Art Unit**	
	JESSICA ROBERTS	2621	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 07/02/2008.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-15 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-15 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date 121/20/2004
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 06/02/2008 has been entered.

Response to Arguments

2. Applicant's arguments filed 07/02/2008 have been fully considered but they are not persuasive.

3. As to applicants argument regarding any of the references alone or in combination disclose that the image edge data components projected onto an object plane to produce respective object edge data component.

4. The examiner respectfully disagrees.

5. Kosuge discloses it is therefore an object of the present invention to provide a size inspection or measurement method and a size inspection or measurement apparatus which can measure sizes of an object of which a measurement position is not easily determined and which an be determined acceptability of the contour of the object, column 2 line 14-20. Further disclosed is that an image projected by the microscope 1 is picked up by the video camera 3 and is fed to the size measurement processor, column 4 line 49-52. Since contour is defined as the general form or structure of something:

characteristics and the projected image is fed to the size measurement processor, it is clear to the examiner that the combination of Kosuge and Bachelder more than meets the claim limitation.

6. As to applicant's argument for unamended claim 2, that Kosuge and Bachelder do not disclose for example, adjusting the object edge data component by subtracting an amount substantially equal to the ration multiplied by the relative distance between the object edge data component and the position of the camera's focal point in the object plane.

7. The examiner respectfully disagrees.

8. Kosuge, the XY stage moves the inspection object into a view of field of the optical microscope, col. 8 line 62-64. Furthermore, by moving the either the camera or the stage, it would allow for the object to be positioned a field of view of the camera).

9. As to applicants argument that Bachelder does not disclose any of the following other features of claim 5: calculating a repetitive fist parameter relating to a notional reference line extending from the object edge data component, calculating a second parameter relating to a notional line extending between the object data component and a reference point in the object plane, and comparing the difference between said first and second parameter against a threshold value.

10. The examiner respectfully disagrees. Bachelder discloses in further accord with this embodiment of the invention, once the boundary points 150 have been associated with edges, 102 A-102D of the model, the method can use optional steps 48-50 to identify and discard categorized boundary points that are out of line with similarly

situated points, column 9 line 51-56. Since Bachelder discloses the method can use optional steps to determine and discard boundary points outside of similar situated points, it is clear to the examiner that Bachelder would be more than fully capable of performing optional steps for determining the locations of the object edge data, which reads upon the claimed limitation.

11. As to applicants argument that Bachelder either on its own or in combination with Kosuge and/or Buckley do not disclose or suggest the combination called for in claim 5.

12. The examiner respectfully disagrees. See discussion above for claim 5.

Specification

13. The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 CFR 1.75(d)(1) and MPEP § 608.01(o). Correction of the following is required: The specification does not disclose to generate the 3D image without requiring of structured light to the object or the combination of data components from multiple images by triangulation.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. Claims 1-8, 12-13, and 14-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kosuge et al., US-6, 571, 196 in view of Bachelder et al., US-5, 974, 169 and further in view of Applicant Admitted Prior Art (AAPA).

Regarding **claim 1** Kosuge discloses a work surface providing an object plane on which, in use, the object to be inspected is located (XY stage; col. 4 line 14 and **6**); and a camera having a focal point and a field of vision arranged with respect to the work surface so that at least part of the work surface is within the camera's field of vision (video camera; col. 1 line 16-19 and **3.** Further, it is clear to the examiner that the video camera includes a focal point and field of view), the camera being arranged to capture an image of the object (fig. 2), the image comprising a plurality of image data components (pixels; col. 3 line 39), the system further including an apparatus for processing the object image (processor; col. 4 line 12 and **4**), the apparatus being arranged to receive image data components from the camera and to identify a plurality of said image data components that represent the position of a respective edge component of the object in an image plane, wherein, during the capture of image by the camera, the camera and the object are fixed with respect to one another (Kosuge; fig. 1), upon determining that an object edge data component relates to an edge of the object that is offset above the work surface, to adjust the value of the object edge data component by an amount depending on the ratio of the size of the offset in a direction

generally perpendicular with the work surface to the perpendicular distance of the camera's focal point from the object plane (Kosuge; XY stage moves the inspection object into a view field of the optical microscope, col. 8 line 62-64. The examiner takes the position that, upon determining that an object edge data component is above the work surface, to adjust the value of the object edge data component by an amount depending on the ratio of the size of the offset in a direction generally perpendicular with the work surface to the perpendicular distance of the camera's focal point from the object plane is nothing more that adjusting the field of view for the camera. Also, the examiner takes the position that the offset is when the object is not located in the field of view of the camera, which would include being offset in the x, y, and z plane).

Kosuge is silent in regards to the processing apparatus being further arranged to determine whether each object edge data component relates to an edge of the object that lies on the work surface or to an edge of the object that is offset above the work surface; and processing apparatus being arranged to project each image edge data component onto the object plane to produce a respective object edge data component in the object plane.

However, Bachelder teaches the processing apparatus being further arranged to determine whether each object edge data component relates to an edge of the object that lies on the work surface or to an edge of the object that is offset above the work surface (points apparently lying on a boundary of the object, but outside a bounding box, are ignored, col. 2 line 31-34); and processing apparatus being arranged to project each image edge data component onto the object plane to produce a respective object

edge data component in the object plane (the boundary points in the image are labeled to denote the respective edges to which they belong based on the locations and orientations of those points, and locations of the plural bounding boxes, col. 2 line 26-29).

Therefore, it would have been obvious to one of ordinary skill in the art to modify the apparatus of Kosuge with the technique as disclosed in Bachelder in order to provide improved machine vision methods and, particularly, improved methods for determining characteristics of an object in an image.

The combination of Kosuge and Bachelder as a whole are silent in regards to a single image; apparatus being arranged to receive image data components from a single image of the object from the camera and to generate, using said image data components of said single image, three dimensional data representing a least part of the object, and wherein in order to generate said three dimensional data the apparatus is arranged to identify a plurality of said image data components that represent the position of a respective edge component of the object in an image plane.

However, AAPA discloses where alternatively some systems employ specialized optical equipment such as a telecentric lens or a line scan camera, to constrain the system so that 3D measurement data can be resolved from a single image [0005]. Since measurement is synonymous with dimensions and dimension is one of three coordinates determining a position in space or four coordinates determining a position space and time and AAPA discloses to perform 3D measurements form a single image, it is clear to the examiner that the 3D measurement data obtained would be fully

capable of identifying image data components that represent the position of the object, which reads upon the claimed limitation.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the teachings of AAPA with Kosuge (modified by Bachelder) for allowing for more efficient image analysis.

Regarding **claim 2**, the combination of Kosuge, Bachelder, and AAPA as a whole teaches everything as claimed above, see claim 1. In addition, Kosuge further teaches wherein when an edge profile of the object taken in a plane generally perpendicular to the object plane is generally perpendicular to the object plane, or is undercut, said object edge data component is adjusted by subtracting an amount substantially equal to said ratio multiplied by the relative distance between the object edge data component and the position of the camera's focal point in the object plane (Kosuge, the XY stage moves the inspection object into a view of field of the optical microscope, col. 8 line 62-64. Furthermore, by moving the either the camera or the stage, it would allow for the object to be positioned a field of view of the camera).

Regarding **claim 3**, the combination of Kosuge, Bachelder, and AAPA teaches everything as claimed above, see claim 1. In addition, Kosuge teaches the processing apparatus is arranged to determine if the angle of the beveled edge profile is greater than the angle made by a line of sight from the camera's focal point to said object edge data component and, upon so determining, to adjust said object edge data component by subtracting an amount substantially equal to said ratio multiplied by the relative distance between the object edge data component and the position of the camera's

focal point in the object plane and by adding an amount substantially equal to the distance in the object plane between the edges of the beveled profile along said line of sight (Kosuge, the XY stage moves the inspection object into a view of field of the optical microscope, col. 8 line 62-64. Furthermore, by moving the either the camera or the stage, it would allow for the object to be positioned a field of view of the camera). Kosuge is silent in regards to wherein when an edge profile of the object taken in a plane generally perpendicular to the object plane is beveled.

However, Bachelder teaches wherein when an edge profile of the object taken in a plane generally perpendicular to the object plane is beveled (Bachelder, determining the characteristics of the object of any polygon shape; col. 4 line 64-66).

Therefore, it would have been obvious to one of ordinary skill in the art to modify the apparatus of Kosuge (modified by AAPA) with the technique as disclosed in Bachelder in order to provide improved machine vision methods and, particularly, improved methods for determining characteristics of an object in an image.

Regarding **claim 4**, the combination of Kosuge, Bachelder, and AAPA as whole teaches everything as claimed above, see claim 1. In addition, Kosuge teaches the processing apparatus determines that an object edge data component relates to an edge of the object that lies on the work surface, the processing apparatus is arranged to determine if the angle of the undercut edge profile is greater than the angle made by a line of sight from the camera's focal point to said object edge data component and, upon so determining, to adjust said object edge data component by an amount substantially equal to the distance in the object plane between the edges of the undercut profile

along said line of sight (Kosuge, the XY stage moves the inspection object into a view of field of the optical microscope, col. 8 line 62-64. Furthermore, by moving the either the camera or the stage, it would allow for the object to be positioned a field of view of the camera). Kosuge is silent in regards to an edge profile of the object taken in a plane generally perpendicular to the object plane is undercut.

However, Bachelder teaches an edge profile of the object taken in a plane generally perpendicular to the object plane is undercut (Bachelder, determining the characteristics of the object of any polygon shape; col. 4 line 64-66)

Therefore, it would have been obvious to one of ordinary skill in the art to modify the apparatus of Kosuge (modified by AAPA) with the technique as disclosed in Bachelder in order to provide improved machine vision methods and, particularly, improved methods for determining characteristics of an object in an image.

Regarding **claim 5**, the combination Kosuge, Bachelder, and AAPA a whole teaches everything as claimed above, see claim 1. Kosuge is silent in regards to wherein the object has a first side facing the work surface and a second side facing the camera that is spaced apart from the first side (Kosuge discloses an by stage 6, an xy driver 7, and an inspection object 2 are provided. In response to a signal from the CPU 43, the xy driver 7 drives xy stage 6 to move the object 2 to an appropriate position for an optical microscope, column 4 line 9-19) , and the processing apparatus determines whether each object edge data component relates to an edge of the side of the object that faces the work surface or to an edge of the object on the side that faces the camera by calculating a respective first parameter relating to a notional reference line extending

from the object edge data component, calculating a second parameter relating to a notional line extending between the object data component and a reference point in the object plane, and comparing the difference between said first parameter and said second parameter against a threshold value.

However, Bachelder teaches the processing apparatus determines whether each object edge data component relates to an edge of the object that lies on the work surface or to an edge of the object that is spaced apart from the work surface by calculating a respective first parameter relating to a notional reference line extending from the object edge data component, calculating a second parameter relating to a notional line extending between the object data component and a reference point in the object plane, and comparing the difference between said first parameter and said second parameter against a threshold value (Bachelder; discloses where the method can use optional steps to identify and discard categorized boundary points that are out of line with similarly situated points. In addition, Bachelder also teaches any points lying more than a specified distance from the corresponding line are discarded, col. 9 line 51-63 and **48, 50.** Furthermore, the examiner takes the position that the object is spaced apart from the work surface to be that object edge is not in proximity of the other object edges).

Therefore, it would have been obvious to one of ordinary skill in the art to modify the apparatus of Kosuge (modified with AAPA) with the technique as disclosed in Bachelder in order to provide improved machine vision methods and, particularly, improved methods for determining characteristics of an object in an image.

The combination of Kosuge, Bachelder, and AAPA as a whole does not explicitly discloses wherein the object has a first side facing the work surface and a second side facing the camera that is spaced apart from the first side. Kosuge more than fairly suggest where the object has a first side facing the work surface and the second side facing the camera. Kosuge discloses a xy stage 6, a xy driver 7, and an inspection object 2 are provided. In response to a signal from the CPU 43, the xy driver 7 drives xy stage 6 to move the object 2 to an appropriate position for an optical microscope, column 4 line 9-19). Since the object is placed on the xy stage for inspection, it is clear to the examiner that Kosuge discloses a first side facing the work surface (bottom of the object) and a second side facing the camera (top of the object), which reads upon the claimed limitation.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention that the object would a first side facing the work surface and a second side facing the camera for providing accurate inspection of an object.

Regarding **claim 6** the combination of Kosuge, Bachelder, and AAPA teaches everything as claimed above, see claim 5. Kosuge is silent in regards to wherein said first parameter comprises the value of an angle between an angle reference axis and said notional reference line extending from the object edge data component.

However, Bachelder teaches wherein said first parameter comprises the value of an angle between an angle reference axis and said notional reference line extending from the object edge data component (Bachelder, col. 8 line 32-46 and fig. **3E** Bachelder discloses a method that categorizes boundary points of the object in the

image as corresponding with edges of the real world object, or its model, if those points lie in the corresponding bounding boxes. In accord with steps **42, 46** the method identifies points as residing in bounding boxes and therefore corresponds to the appropriate edge).

Therefore, it would have been obvious to one of ordinary skill in the art to modify the apparatus of Kosuge (modified by AAPA) with the technique as disclosed in Bachelder in order to provide improved machine vision methods and, particularly, improved methods for determining characteristics of an object in an image.

Regarding **claim 7**, the combination of Kosuge, Bachelder, and AAPA as a whole teaches everything as claimed above, see claim 5. Kosuge is silent in regards to wherein said second parameter comprises the value of an angle between the angle reference axis and said notional reference line extending between the object edge data component and said reference point.

However, Bachelder teaches said second parameter comprises the value of an angle between the angle reference axis and said notional reference line extending between the object edge data component and said reference point (see analysis for claim 6. Furthermore, the method as disclosed by Bachelder includes to find points in respective bounding boxes, compare orientations of point with expected orientations and thus categorizing points as correlation with model or real-world object **42,44,46**).

Therefore, it would have been obvious to one of ordinary skill in the art to modify the apparatus of Kosuge (modified by AAPA) with the technique as disclosed in

Bachelder in order to provide improved machine vision methods and, particularly, improved methods for determining characteristics of an object in an image.

Regarding **claim 8**, the combination of Kosuge, Bachelder, and AAPA as a whole teaches everything as claimed above, see claim 5. Kosuge is silent in regards to said reference point on the object plane comprises the position of the camera's focal point in the object plane and said notional reference line extending from the object edge data component comprises a line normal to the object at said object edge data component, and wherein said threshold value is 90 degrees.

However, Bachelder teaches said reference point on the object plane comprises the position of the camera's focal point in the object plane and said notional reference line extending from the object edge data component comprises a line normal to the object at said object edge data component, and wherein said threshold value is 90 degrees (see analysis for claims 6-7. Furthermore, the method as disclosed by Bachelder includes to estimate position, orientation and uncertainty of object in image which includes where the points have a specified tolerance of the expected angular orientation of an edge, if so, the method categorizes the points as corresponding with the associated edge, col. 10 line 19-36 **36,42,44,46**).

Therefore, it would have been obvious to one of ordinary skill in the art to modify the apparatus of Kosuge (modified by AAPA) with the technique as disclosed in Bachelder in order to provide improved machine vision methods and, particularly, improved methods for determining characteristics of an object in an image.

Regarding **claims 12-13,** which recite a corresponding method to the system for inspection of claim 1. Thus, the analysis and rejection made in claim 1 also apply here because the inspection system in claim 1 would have necessarily performed the method steps in claim 12.

In further regards to **claim 13,** the combination of Kosuge, Bachelder, AAPA as whole teaches as a whole further teach a processor based system. Hence a computer program product comprising computer useable code for causing a computer to perform the method steps of the system of claim 1 would have been inherent.

Regarding **claim 14,** the combination of Kosuge, Bachelder, and AAPAA as a whole teaches everything as claimed above, see claim 1. Kosuge is silent in regards to a system as claimed in claim 1, wherein said object is substantially planar and has a substantially constant thickness, said processing apparatus being arranged to combine said object edge data components wit a data component representing said thickness in order to generate said three dimensional data representing said object.

However, Buckley teaches where wherein said object is substantially planar and has a substantially constant thickness (fig. 1 and fig. 5) , said processing apparatus being arranged to combine said object edge data components wit a data component representing said thickness in order to generate said three dimensional data representing said object (The preferred embodiment uses sensors that directly measure surfaces in three-dimensions, although the analysis methods described here also apply to diffuse light sources or edge-based measurement, (column 5 line 52-55). Further, disclosed is a method for determining the geometric model, described below is much

simpler than determining a complete CAD-based geometric model. In a CAD-based geometric model, every surface of the part must be included for a completed description, (column 29 line 3-6). Once the parameters (location, alignment and size) and thickness of a surface primitive are found from the scanned data, its extent can be determined. For example, a plane defined only by its parameter set p locates a plane of infinite extent. However, a real object 130 (FIG. 12) has surfaces that are limited, not infinite. Since the extents of a surface are often defined by other surfaces, the intersection of surfaces can define what portion of the primitive belongs to model 140 and which does not. Most surfaces, such as surface 132a, are limited by intersections with other surfaces. Edge 137a is the intersection of plane surface 132a and cylindrical surface 132b. Similarly, edge 137b forms the intersection between plane surfaces 137a and 132g limiting the extent of plane 132a (column 30 line 54-67). Therefore, it is clear to the examiner that Buckley includes the thickness and edge data to produce the 3D image since, Buckley discloses for a CAD-based geometric model, every surface of the part must be included for a completed description.

Therefore, it would have been obvious to one of ordinary skill in the art to modify Kosuge (modified by Bachelder and AAPA) with the technique as disclosed in Buckley in order to optimize the inspection process in order to increase the speed and improve the accuracy of the inspection.

Regarding **claim 15,** the combination of Kosuge, Bachelder, and AAPA as a whole teaches everything as claimed above, see claim 1. Kosuge is silent in regards to a system as claimed in claim 1, wherein said processing apparatus is arranged to

generate said three dimensional data from object edge data components obtained from a single image of said object.

However, AAPA discloses where alternatively some systems employ specialized optical equipment such as a telecentric lens or a line scan camera, to constrain the system so that 3D measurement data can be resolved from a single image [0005]. Since measurement is synonymous with dimensions, and dimension is one of three coordinates determining a position in space or four coordinates determining a position space and time and AAPA discloses to perform 3D measurements form a single image, it is clear to the examiner that the 3D measurement data obtained would be fully capable of identifying image data components that represent the position of the object, which reads upon the claimed limitation.

4. Claims 9-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kosuge et al., US-6, 571, 196 in view of Bachelder et al., US-5, 974, 169 and further in view of Applicant Admitted Prior Art (AAPA) and in further view of Buckley et al., US-6,064,759.

Regarding **claim 9**, the combination of Kosuge, Bachelder, and AAPA as whole teaches everything as claimed above, see claim 1. Kosuge is silent in regards to the processing apparatus is arranged to calculate a line of sight from the camera's focal point to the object edge data component and to determine the point at which the line of sight substantially meets the object edge, and to determine the amount of the offset depending on the location of said point.

However, Buckley teaches using a camera and a laser to determine surface measurements of the objects. The camera in conjunction with the laser intersects the object; the intersection points on the object are illuminated as a line and on the plate as a line. Each frame of the camera records the image of laser lines illuminating object as a set of three values; column value, row value and frame number. The set of values can be transformed or mapped into the (x, y, z) coordinate system to give the location of xyz points on the object surface with respect to the object reference system, col. 6 line 6-67 and col. 7 line 1-67 and col. 8 line 1-14).

Therefore, it would have been obvious to one of ordinary skill in the art to modify Kosuge (modified by Bachelder and AAPA) with the technique as disclosed in Buckley in order to optimize the inspection process in order to increase the speed and improve the accuracy of the inspection.

Regarding **claim 10**, the combination of Kosuge, Bachelder, and AAPA as a whole teaches everything as claimed above, see claim 9. Kosuge is silent in regards to wherein the line of sight lies in a plane substantially normal to the edge of the object at the location of the object edge data component.

However, Buckley teaches 3D imaging from edge points constructed from the column value, row value, and frame number of the pixel, col. 12 line 25-31, also see analysis made in claim 9).

Therefore, it would have been obvious to one of ordinary skill in the art to modify Kosuge (modified by Bachelder and AAPA) with the technique as disclosed in Buckley

in order to optimize the inspection process in order to increase the speed and improve the accuracy of the inspection.

5. Claim11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kosuge et al., US-6, 571, 196 in view of Bachelder et al., US-5, 974, 169 and further in view of Applicant Admitted Prior Art (AAPA) and further in view of Vossler et al., US-5,537,519.

Regarding **claim 11,** which recites a corresponding apparatus to the inspection system of claim 1. Thus, the analysis and rejection made in claim 1 also apply here because the inspection system in claim 1 would necessitate the need for an apparatus capable of providing the limitations of the apparatus in claim 11. In addition, to using said image data components without requiring the application of structured light to the object or the combination of data components from multiple images by triangulation, three dimensional data representing at least part of the object, and wherein in order to generate said three dimensional data without requiring the application of structured light to the object or the combination of data components from multiple images by triangulation.

However, Vossler discloses a system and method converts from the boundary representation ('b-rep") of a solid object to the constructive solid geometry ("CSG") representation thereof. The b-rep of a three-dimensional object is converted into a CSG expression by constructing a set of separators through triples of vertices on the face of the solid (see abstract). Further, the present invention relates generally to computer-aided design, manufacture and engineering and more particularly to a system and method for improved solid object modeling (column 1 line 9-12). In three-dimensions the

b-rep input is not as simple because a description of a three-dimensional object is needed. Therefore, instead of a list of lines and arcs one could employ a solid or geometric modeling system such as Parasolid.RTM to generate a list of the faces of the solid which describes the natural half spaces. IT should be understood that a number of other commercially available products that could be used to generate the boundary representation unit (column 16 line 7-14). Therefore, it is clear to the examiner that Vosseler discloses to generate a 3 dimensional object from a 3D model, which reads upon the claimed limitation.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the teachings of Vossler with Kosuge (modified by Bachelder and AAPA) for providing The ability to compute separating surfaces contributes to the solution of several important problems such as b-rep to CSG conversion, definition of faces, boundaries, and solids using standard set operations (union, intersection, complement), construction of new representations of surfaces, solids and other point sets, and development of new software and hardware architectures for geometric modeling systems supporting multiple representations, Column 2 line 33-40.

Conclusion

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

7. Rao et al., US-6,278,798 Image object recognition system and method

8. Kondo et al., Three dimensional modeling apparatus and method utilizing the extraction of topological data, as from two-dimensional drawing

Contact

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JESSICA ROBERTS whose telephone number is (571)270-1821. The examiner can normally be reached on 7:30-5:00 EST Monday-Friday, Alt Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Marsha D. Banks-Harold can be reached on (571) 272-7905. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Marsha D. Banks-Harold/
Supervisory Patent Examiner, Art Unit 2621
/Jessica Roberts/
Examiner, Art Unit 2621